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ABSTRACT

To aid in increasing the number of students choosing careers in science and engineering, the National Governors' Association has been working with states to develop policies to increase the number of women and minorities in mathematics and science. The following examples of state activities are discussed: (1) California Advocacy for Mathematics (CAMS) and Science, which is aimed at preparing all students to take college preparatory courses in mathematics and science; (2) CONSTRUCT, Connecticut's Statewide Systemic Initiative (SSI), which focuses on the achievement of female students in mathematics, science, and engineering in Connecticut; (3) Georgia Initiative in Mathematics and Science (GIMS), which has an overarching goal of diversity; (4) Michigan's Statewide Systemic Initiative (MSSI) addresses equity concerns in education and teacher education; (5) Systemic Initiative for Montana Mathematics and Science (Simms), which includes the development of an action plan to increase the participation of girls and Native Americans in mathematics and science; (6) North Carolina Science and Mathematics Alliance, which supports a network of local partnerships that bring together regional leaders to develop and implement efforts to reform mathematics and science education; and (7) Vermont Institute for Mathematics, Science and Technology, which focuses on increasing the participation of girls in mathematics and science. (ZWH)

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In Brief

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Economic Development and Commerce Policy Studies

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Achieving Equity in Mathematics, Science, and Engineering Education

Overview

With support from the National Science Foundation, the National Governors' Association has been working with states over the past two years to develop policies to increase the number of women and minority engineers. Although a variety of programs have proven effective in attracting and retaining women and minorities in mathematics and science, these efforts continue to be fragmented and implementation has not been widespread.

In 1991 the National Science Foundation established the Statewide Systemic Initiative (SSI) program to "encourage improvements in science, mathematics, and engineering education through comprehensive systemic changes in the education systems of the states."* Twenty-five states and Puerto Rico have received five-year matching grants through the SSI program (see listing of participating states on page 2).

An overriding goal of the SSI program is to ensure that all students succeed in mathematics and science. As a result, each SSI addresses the issues of equity and diversity. A review of state SSI programs indicates that although all states are addressing gender equity and diversity through their SSI efforts, they are experimenting with several different approaches. These approaches include:

- impacting teaching practice at the K - 12 levels by providing training for teachers, changing teacher preparation programs to include training on equity and diversity, and developing curricula and instructional materials that are relevant to women and minority students;
- reaching large numbers of students from underrepresented groups by targeting districts and/or schools with high percentages of minority and low-income students; and
- supporting special programs for women and minority students, such as summer camps or other enrichment activities.

Most of these efforts are at an early stage of implementation. It is clear, however, that unless women and underrepresented minorities are given equal access to quality mathematics, science and technology education, the nation will be unable to reach the goal of high achievement for all students in mathematics, science, and technology.

* National Science Foundation, *Statewide Systemic Initiatives in Science, Mathematics, & Engineering: State Profiles. (NSF 93-171), p.3, 1994.*

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States Participating in NSF'S Statewide Systemic Initiative Program

State	*Recipient*	*Grant Awarded*	*5-Year Award*
Arkansas	Department of Higher Education	1993	$10,000,000
California	Department of Education	1992	$10,000,000
Colorado	Department of Education	1993	$10,000,000
Connecticut	Academy for Education in Mathematics, Science and Technology, Inc.	1991	$ 7,866,725
Delaware	Department of Public Instruction	1991	$ 5,436,190
Florida	Department of Education	1991	$ 7,913,882
Georgia	University of Georgia	1992	$10,000,000
Kentucky	Science & Technology Council, Inc.	1992	$ 9,672,300
Louisiana	Systemic Initiative	1991	$10,000,000
Maine	Mathematics and Science Alliance	1992	$10,000,000
Massachusetts	Department of Education	1992	$10,000,000
Michigan	Department of Education	1992	$ 9,990,970
Montana	Montana Council of Teachers of Mathematics	1991	$10,000,000
Nebraska	Mathematics and Science Coalition	1991	$10,000,000
New Jersey	Rutgers University	1993	$10,000,000
New Mexico	SSI in Mathematics and Science Education	1992	$ 9,944,000
New York	State Education Department	1993	$10,000,000
North Carolina	Science and Mathematics Alliance	1991	$ 7,856,586
Ohio	Miami University	1991	$ 9,990,970
Puerto Rico	University of Puerto Rico	1992	$10,000,000
Rhode Island	Department of Elementary and Secondary Education	1991	$ 9,351,000
South Carolina	Department of Education	1993	$ 9,676,696
South Dakota	National Science Foundation Statewide Systematic Initiative	1991	$ 7,517,040
Texas	Trinity University	1992	$10,000,000
Vermont	Institute for Science, Math and Technology	1992	$ 9,695,922
Virginia	Department of Education	1992	$ 9,615,914

Source: National Science Foundation, *Statewide Systemic Initiatives in Science, Mathematics, & Engineering: State Profiles* (NSF 93-71), 1994.

Examples of State Activities

California

The California Advocacy for Mathematics and Science (CAMS) initiative is aimed at preparing all students, including historically underrepresented groups, to take college preparatory courses in mathematics and science at the high school level. CAMS is focusing on two areas: elementary science and middle school mathematics. There are currently 240 middle schools participating in Mathematics Renaissance, and 600 elementary schools participating in the California Science Implementation Network. Both efforts include developing state-of the-art curriculum units and providing training and on-site assistance to teachers. To ensure that CAMS is addressing the needs of underrepresented groups, an effort was made to recruit schools with diverse student populations. The 640 schools selected to participate reflect the state's demographic make-up—currently, more than half of the state's school age population is Hispanic, African American, or Asian. In addition, emphasis is being placed on selecting instructional materials that ensure access to women and minority students. Finally, CAMS cooperates with existing California programs that seek to prepare women and minorities with strong mathematics and science skills, and to interest students in science and engineering careers such as the Mathematics, Engineering, and Science Achievement (MESA) program. MESA provides counseling, tutoring, and career development services to promote higher achievement and to encourage students to enroll in college-preparatory work. Contact: Thomas Sachse, CAMS, (916) 657-2914.

Connecticut

CONNSTRUCT, Connecticut's SSI effort, is a joint undertaking of the Connecticut Academy for Education in Mathematics, Science and Technology, an independent, non-profit organization, and the Department of Education. Although, initially they sought to address the needs of underrepresented groups in general, their early work led them to separate the issue of gender equity. After holding meetings throughout the state and gathering baseline data on the achievement of female students in mathematics, science, and engineering in the state, they developed a proposed project, United Connecticut for Women in Science, Engineering, and Mathematics (SEM), which has been submitted to the National Science Foundation. The project, which will seek to make permanent changes in girls' and womens' access to, and participation and achievement in mathematics and science, including the following components:

- a Women in Science, Engineering, and Mathematics Clearinghouse to collect, analyze, and disseminate data related to girls and women in SEM in Connecticut and to encourage new research if needed;
- a statewide public awareness campaign promoting the importance of quality education in mathematics, science, and technology;
- activities to showcase effective ways to build self-esteem among girls and women; and
- design of a long-term pre-service and in-service program related to women in SEM issues.

The approach CONNSTRUCT has taken to meet the needs of underrepresented minority students is to target the SSI to nineteen school districts that account for three-quarters of the state's minority student population. CONNSTRUCT is providing these districts with technical, financial, and community support to implement locally developed improvement plans for mathematics and science teaching and learning based on established and proposed national standards. Contact: Richard Cole, CT. Academy for Education in Mathematics, Science & Technology, Inc., (203) 346-1177.

Florida

Florida's SSI strategy is to impact teaching practice in K - 12 by providing professional development for teachers, by developing models of effective approaches, by selecting curriculum materials that are sensitive to diversity issues, and by providing technical assistance to school districts to reform or improve their science and mathematics teaching. They are collaborating with the Higher Education Consortium, which includes representatives of nine universities, twenty-eight community colleges, and various school districts, to enhance science and teacher preparation at the post-secondary level and to recruit more women and minorities into mathematics and science careers, especially teaching. Contact: Thomas Baird, Florida Department of Education, (904) 922-4207

Georgia

Diversity is an overarching goal of the Georgia Initiative in Mathematics and Science (GIMS). As a first step, Georgia has brought together academic interests throughout the state to develop a "Diversity Framework." The framework, which will represent a consensus on what is meant by diversity, will be used to guide teacher development and curriculum, instruction, and assessment. Additional activities are aimed at attracting both women and minorities into science education careers. A Women in Science and Engineering center has been established at Georgia Tech and GIMS is working with two historically black universities to attract minority students into science teaching careers. Contact: Michael Padilla, Science Education, University of Georgia, (706) 542-1763.

Michigan

Two components of Michigan's Statewide Systemic Initiative (MSSI) address equity concerns. The Models of Effective Learning component targets high-risk, economically underserved students in urban and extreme rural districts. Thirty districts with a high percentage of underrepresented groups (minorities, women, and students with disabilities) with low achievement in mathematics and science were selected through a competitive process to receive technical assistance and a cash award of up to $75,000 annually for five years. This component is designed to address the discrepancy in achievement between white and non-white Michigan students by bringing in the community to determine how to reform the system. A second component of MSSI focuses on teacher education. In addition to recruiting more minority mathematics and science teachers, diversity issues are being incorporated into teacher preparation programs. Contact: Nancy Mincemoyer, MSSI, Michigan Department of Education, (517) 373-4990.

Montana

The Systemic Initiative for Montana Mathematics and Science (SIMMS) includes the development of an action plan to increase the participation of girls and Native Americans in mathematics and science. Emphasis is being placed on developing curricula and materials that are

effective in teaching women and minorities. A number of specific efforts are underway to recruit Native American teachers including addressing articulation between tribal colleges and universities and an American Indians in Mathematics program that brings high school students to the Montana State University campus. Contact: Johnny Lott, Department of Mathematical Sciences, University of Montana, (406) 243-2696.

North Carolina

The North Carolina Science and Mathematics Alliance, a public private enterprise sponsored by the North Carolina Board of Science and Technology, is administering North Carolina's SSI. The alliance supports a network of local partnerships that bring together regional leaders to develop and implement efforts to reform mathematics and science education. In order to improve access, participation, and the achievement of women and minorities in mathematics science and technology, the alliance established a program to:

- develop and disseminate information on new and innovative methods of reaching these underserved populations, and
- assist regional partnerships in developing long (five-year) and short (one-year) programs for empowering minorities and women in science, mathematics, and technology by raising teacher awareness of equity issues, helping them improve their skills in dealing with these issues, and increasing the opportunities and expectations of minority and female students in science and mathematics.

The Alliance is using the Gender/Ethnic Equity Student Achievement (GESA) program to assist the regional partnerships. GESA was developed originally as a model program by the Los Angeles County, California School District in 1983. This program trains GESA facilitators who then work with groups of twenty to thirty-six teachers, who attend six monthly workshops. These workshops help teachers examine their own biases as demonstrated by their behavior toward male and female, white and nonwhite students in the classroom, and identifies resources to address specific curriculum issues. Contact: Joyce Hilliard Clark, North Carolina Science and Mathematics Alliance, (919) 733-9161.

Vermont

Vermont's SSI is being carried out by the Vermont Institute for Mathematics, Science and Technology. To increase the participation of girls in mathematics and science, VIMST supports a summer camp for high school and junior high girls at Vermont Technical College. The camp brings students to the college campus to participate in hands-on workshops designed to interest them in careers in mathematics and science. An effort is made to select girls from rural, disadvantaged families. Financial aid is available to offset the cost of the camp, if needed. A Math and Science Institute brings girls who previously participated in a summer camp program back for four days of intensive mathematics and science workshops. Contact: Amy Emler-Shaffer, Women in Technology, Vermont Technical College, (802) 728-3391.